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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/784,585	02/23/2004	Michael Long	87181RLO	9644

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EXAMINER

MARKHAM, WESLEY D

ART UNIT PAPER NUMBER

1762

DATE MAILED: 02/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/784,585

Applicant(s)

LONG ET AL.

Examiner

Wesley D. Markham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/6/05 (the RCE).
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-12 and 14-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-12 and 14-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application on 12/6/2005 after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action (i.e., the final Office action mailed on 9/19/2005) has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/14/2005 has been entered.

Response to Amendment

2. Acknowledgement is made of the amendment filed by the applicant on 11/14/2005, in which Claims 1, 2, 5 – 11, and 14 – 16 were amended and Claims 4, 13, and 17 – 25 were canceled. **Claims 1 – 3, 5 – 12, and 14 – 16** are currently pending in U.S. Application Serial No. 10/784,585, and an Office action on the merits follows.

Drawings

3. The three (3) sheets of formal drawings filed on 4/11/2005 are acknowledged and approved by the examiner.

Claim Observations

4. Please note that the 35 U.S.C. 102 and 103 rejections based, at least in part, on Kamiyama et al. (USPN 6,340,501) and Yamazaki et al. (US 2002/0132047 A1) and set forth in paragraphs 8 – 15 of the previous Office action are withdrawn in light of the applicant's amendments to independent Claims 1 and 10. Specifically, independent Claims 1 and 10 now require, in part, actively cooling the solid organic material in the first region of the vaporization apparatus to be below the vaporization temperature, heating a second region of the vaporization apparatus above the vaporization temperature so that there is a steep thermal gradient across the thickness of the organic material between the regions, and metering the solid organic material from the first region to the second region so that a thin cross section of the material vaporizes to form a film on a substrate surface. Neither Kamiyama et al. (USPN 6,340,501) nor Yamazaki et al. (US 2002/0132047 A1) teaches the claimed active cooling in the context of the claimed method. In withdrawing the aforementioned rejections, the examiner notes that simply not heating the solid organic material in some region(s) of the vaporization apparatus (as taught by Kamiyama et al. and Yamazaki et al.) does not meet the limitation of "actively maintaining by cooling" in independent Claims 1 and 10. In other words, a lack of heating does not read on "actively maintaining by cooling" as claimed by the applicant.

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5. Regarding independent Claim 1, as amended, it is clear that "the second heating region" recited in line 2 of step d) refers to the "second region" discussed in step c) of the claim, and the claim has been interpreted as such.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1 – 3, 5 – 12, and 14 – 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
8. The term "steep" in independent **Claim 1** (from which **Claims 2, 3, and 5 – 9** depend) and independent **Claim 10** (from which **Claims 11, 12, and 14 – 16** depend) is a relative term which renders the claims indefinite. The term "steep" is not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Specifically, the claims of the instant application now require that there be a "steep thermal gradient" across the thickness of the organic material between the first and second regions. However, it is unclear how quickly the temperature must change between the regions to constitute a "steep" thermal gradient in the context of the claimed invention. As such, the scope of the claims is unclear.

9. **Claims 6 and 15** require that the first region be maintained at a constant heater temperature. However, independent Claims 1 and 10 require that the first region be actively cooled. These limitations appear to be contradictory in the context of the claimed invention (i.e., the first region cannot both be actively cooled and maintained at a constant heater temperature), and the contradictory limitations render the scope of the claims vague and indefinite.
10. Independent **Claim 10** requires, in part, "heating a second region of the vaporization apparatus above the vaporization temperature of the solid material so that there is a steep thermal gradient across the thickness of the organic material between the first and second regions of each of the components of the solid organic material". This limitation renders the scope of Claim 10 – 12 and 14 – 16 unclear because it is unclear whether "the first and second regions" refer to (1) regions of the vaporization apparatus, as indicated by steps b) and c) of the claim, or (2) regions of the components of the solid organic material, as indicated by the phrase, "...the first and second regions of each of the components of the solid organic material" (see the end of step c) of the claim).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
13. Claims 1 – 3 and 5 – 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US 2004/0016400 A1) in view of Yang et al. (US 2005/0072361 A1).
14. Regarding independent **Claim 1**, Kim et al. teaches a method for vaporizing solid organic materials “20” onto a substrate surface to form a film (paragraphs [0001], [0021] – [0025], and [0042]), comprising providing a quantity of solid organic material “20” into a vaporization apparatus (Figure 4; paragraphs [0025] and [0064]), the solid organic material in a first region (i.e., the lower portions of the deposition source “200”, below the top surface of solid organic material “20” – see Figure 4) being below the vaporization temperature, heating a second region of the vaporization apparatus (e.g., using top plate “201” as the heater – see Figure 4) above the vaporization temperature of the solid organic material, and metering, at a controlled rate, solid organic material from the first region into the second region so that a thin cross section (i.e., the upper surface) of the solid organic material is heated at a

desired rate-dependent vaporization temperature, whereby the thin cross section vaporizes to form a film on the substrate surface (Figure 4; paragraphs [0025], [0056] – [0072]). Kim et al. does not explicitly teach actively cooling the solid organic material “20” in the lower portion(s) (i.e., the “first region”) of the deposition source “200”. However, Kim et al. does teach that solid organic materials used as deposition source materials are relatively complex compounds with relatively weak bonding, so intensive care must be taken to avoid decomposition during the vaporization process (paragraph [0004]). Kim et al. also teaches that such solid organic materials are unstable to heat and are degraded due to radiant heat in the deposition process (paragraph [0016]). Yang et al. teaches an analogous process and device for heating and vaporizing solid materials to deposit a layer on a substrate (Figures 1 – 7; paragraphs [0014] – [0018], [0058] – [0069]). Yang et al. teaches that cooling lines “42” / cooling shields “46” are arranged around the outside of the vaporization source (crucible), and cooled alignment rail “64” is arranged at the bottom of the crucible, in order to reduce heat transmission from the crucible to other equipment during an evaporation process and to reduce the amount of time required for cool-down after deposition (Figures 1 – 3; paragraphs [0060] and [0063]). Therefore, it would have been obvious to one of ordinary skill in the art to actively cool the sidewalls and bottom of the vaporization source of Kim et al., as taught by Yang et al., in order to reap the benefits taught by Yang et al. such as reducing heat transmission from the crucible to other equipment during the evaporation process, thereby preventing the organic materials in the crucible from

being degraded by radiant heat, as explicitly desired by Kim et al. By doing so, a “steep thermal gradient” would have inherently been present between the upper surface layer of the solid organic material “20” of Kim et al. (i.e., the layer that is being vaporized) and the lower portions of the organic material “20” below the surface and towards the bottom of the crucible, which are being actively cooled and are not vaporized until being pushed (i.e., metered) to the top of the crucible of Kim et al. Regarding **Claim 2**, the vaporized organic material passes through a vapor efflux aperture “201A” in the top plate “201” (i.e., a permeable member) (Figure 4; paragraphs [0042] and [0057]). Regarding **Claim 3**, the combination of Kim et al. and Yang et al. teaches providing a deposition chamber (Figure 1, paragraph [0025] of Kim) and interrupting the vaporization when a substrate surface is not being coated, which would have inherently minimized chamber wall contamination and conserved organic material (paragraphs [0068], [0071], and [0072] of Kim; [0059] of Yang). Regarding **Claim 5**, a constant volume is maintained in the second heating region (i.e., by pushing up the organic material as it is being evaporated from the top surface to maintain a constant distance between the surface of the organic material and the heating source (paragraphs [0059], [0060], and [0067] of Kim)), thereby inherently leading to the result claimed by the applicant (constant plume shape). Regarding **Claims 6 and 7**, constant temperatures are maintained by Kim and Yang ([0070] of Kim; [0017] and [0064] of Yang).

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15. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al.

(US 2004/0016400 A1) in view of Yang et al. (US 2005/0072361 A1), in further view of Grant et al. (US 2003/0116091 A1).

16. The combination of Kim and Yang teaches all the limitations of **Claim 8** as set forth above in paragraph 14, except for a method further comprising providing the claimed cooling base block (i.e., with a liquid between the cooling base block and the solid organic material to provide thermal contact and a vapor tight seal) surrounding the solid organic material. Specifically, the combination of Kim and Yang teaches using cooling lines surrounding a cooling shield to cool the crucible and solid organic material therein (see paragraph 14 above). However, Grant et al. teaches that a liquid cooling jacket in which liquid is circulated through the jacket and around the vaporization source (i.e., between the cooling base block and the vaporization source material) is effective in cooling a vaporization source material (paragraphs [0011], [0036], and [0037]). Therefore, it would have been obvious to one of ordinary skill in the art to cool the crucible of Kim using a liquid cooling jacket (cooling base block), as taught by Grant et al., instead of cooling lines (as taught by Yang) with the reasonable expectation of success and obtaining similar results (i.e., successfully cooling the crucible, regardless of whether cooling lines or a cooling base block surrounding the crucible is utilized as the cooling means).

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17. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al.

(US 2004/0016400 A1) in view of Yang et al. (US 2005/0072361 A1), in further view of Peng (USPN 6,467,427).

18. The combination of Kim and Yang teaches all the limitations of **Claim 9** as set forth

above in paragraph 14, except for a method wherein the solid organic material is metered on the surface of a rotatable drum. Please note that both Kim et al.

(paragraphs [0059], [0060], and [0067]) and Yang (paragraphs [0061] and [0065])

teach metering the solid material into the second region at a controlled rate that

varies linearly with vaporization rate, thereby maintaining a constant distance

between the surface of the material to be vaporized and the heater. Peng teaches

that supplying a solid evaporation source material into a crucible by using a rotating

cylindrical wheel (i.e., a "rotatable drum") has the advantages of (1) providing a

continuous supply of evaporation source material so that the evaporation chamber

can perform vapor deposition for a long period, (2) providing a fixed quantity of

source material at a fixed interval of time, and (3) never having to stop to reload the

source material, thereby increasing productivity (Figures 2B and 2C; Col.3, line 1 –

Col.4, line 4). Therefore, it would have been obvious to one of ordinary skill in the art

to supply the solid organic material of the combination of Kim and Yang into the

vaporization source by using a rotating drum as taught by Peng et al. in order to

reap the benefits discussed above.

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19. Claims 10 – 12, 14, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US 2004/0016400 A1) in view of Yang et al. (US 2005/0072361 A1), in further view of Yamazaki et al. (US 2002/0132047 A1).
20. The combination of Kim et al. and Yang et al. teaches all the limitations of **Claims 10 – 12, 14, and 15** as set forth above in paragraph 14, except for a method wherein the solid organic material being vaporized comprises at least two organic components. Specifically, Kim et al. teaches producing an organic electroluminescent device (OLED) by vaporizing and depositing a solid organic EL material in general (paragraph [0042]) and does not appear to put any limits on whether this solid organic EL material is a single component material or multi component material. Yamazaki et al. teaches that, in the art of vaporizing solid organic EL materials to produce an OLED (i.e., a process analogous to that of Kim), each organic EL material can be vaporized separately, or plural organic materials (e.g., a light emitting material and a dopant) can be simultaneously evaporated from a single source (paragraph [0144]). It would have been obvious to one of ordinary skill in the art to utilize the method of the combination of Kim and Yang to simultaneously vaporize plural organic materials from a single source, as taught by Yamazaki, because one of ordinary skill in the art would have reasonably expected to reap the benefits of the vaporization process of Kim et al. and Yang et al. (i.e., maintaining the optimum deposition temperature and deposition rate by metering the solid organic material into the vaporization zone as it is consumed – paragraph [0070] of Kim; and preventing radiant heat induced decomposition of the solid

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organic material by cooling the crucible), regardless of whether a single component or multi-component organic material is being vaporized. The number of components in the organic material source would, of course, depend on the desired composition (e.g., dopants) of the organic EL device layer being deposited.

21. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. (US 2004/0016400 A1) in view of Yang et al. (US 2005/0072361 A1), in further view of Yamazaki et al. (US 2002/0132047 A1), in further view of Grant et al. (US 2003/0116091 A1).
22. The combination of Kim, Yang, and Yamazaki teaches all the limitations of **Claim 16** as set forth above in paragraph 20, except for a method further comprising providing the claimed cooling base block (i.e., with a liquid between the cooling base block and the solid organic material to provide thermal contact and a vapor tight seal) surrounding the solid organic material. However, such a limitation would have been obvious based on the teachings of Grant et al. (see paragraph 16 above).

Response to Arguments

23. The applicant's arguments filed on 11/14/2005 have been fully considered but are moot in view of the new grounds of rejection set forth above.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D. Markham whose telephone number is (571) 272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WDM

Wesley D Markham
Examiner
Art Unit 1762



TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER